PATENT

PD-10003870-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

PHILLIP W. BARTH ET AL

Serial No.: (filed herewith) Group Art Unit:

Filed: (filed herewith) Examiner:

For: ADJUSTABLE NANOPORE, NANOTOME, AND NANOTWEEZER

BOX NEW APPLICATION

Assistant Commissioner of Patents

Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

This is a Preliminary Amendment in the above-captioned. Please amend the application as follows:

IN THE SPECIFICATION:

Please replace Paragraph **[0069]** beginning at page 12, line 8 with the following re-written paragraph:

[0069] --One method of actuation which imposes a tilt is given, for example, in U.S. Patent 5,954,079, "Asymmetrical Thermal Actuation in a Microactuator", and it is shown in that patent that tilting actuation offers improved control in the presence of physical phenomena which could lead to snap-off and snap-in. In that patent the physical phenomenon leading to snapping actuation was a thermal phenomenon. In the present invention, surface attraction and stiction due to Van der Waals forces and other forces can be expected to lead to snapping phenomena similar to those noted in, e.g., J.N. Israelachvili, Intermolecular and Surface

Forces, Academic Press, New York, pp. 14-15 (1995), and section 10.7, and tilting actuation used to separate surfaces 130 and 136 is expected to reduce or eliminate such snapping phenomena. Various means of tilting actuation will occur to those skilled in the art and may be employed without departing from the scope and spirit of the present invention.--

Please replace Paragraph **[0094]** beginning at page 19, line 23 with the following rewritten paragraph:

[0094] --Following assembly, the device 100 is then immersed in a desired liquid ionic conductor 170 as shown in FIGS. 3a, 3b, and 3c, and an ionic current is established through the aperture 102 by applying a voltage to electrodes 176 and 178 on opposite sides of the aperture. Walls 174 and 172 comprising, for example, a glass or a polymer may be attached to one or more of lower and upper surfaces 132 and 134 by means including, but not limited to, adhesives, clamps and gaskets, and anodic bonding in order to isolate solution 170 from the surroundings.--

Please replace Paragraph **[0114]** beginning at page 25, line 19 with the following rewritten paragraph:

[0114] --Another alternative embodiment 700 of the invention is illustrated in FIGS. 7a-7b. Hole 702 in membrane 704 is formed by means similar to those used to form hole 602. Edge 706 of body 708 is part of edge 710 which bounds a planar surface of body 708. Edge 706 intersects hole 702 to form an arched opening 712 through which a sphere 714 of diameter 716 may pass. The crown of the arch is point 718, the springer points of the arch are points 720 and 722, and the base of the arch is formed by edge 706. Body 708 is formed by means of, for example, chemical vapor deposition, photolithography, and etching on a surface of substrate 724 which is later etched to form cantilever 726. Cantilever 726 may contain sensing means (not shown), such as piezoresistive sensors to monitor the contact force between membrane 704 and body 708. Such sensing means are well known to those skilled in the art of atomic force microscopy. Cantilever 726 may contain actuation means (not shown), such as piezoelectric actuators to move body 708 in three directional axes and a rotational axis with respect to membrane 704. Such actuators have previously been used in cantilevers for scanning tunneling microscopy, for example, T.R. Albrecht et al, "Microfabrication of

integrated scanning tunneling microscope", Journal of Vacuum Science and Technology, Vol. A8(1), pp. 317-318 (Jan/Feb 1990).--

REMARKS

Claims 1-63 remain in the application.

Pages 12, 19, and 25 are amended to correct certain typographical errors or to be consistent in terminology. The amendments are apparent from the text.

Attached hereto is a marked-up version of the changes made to the specification by the current Amendment. The attached page is captioned "**Version with Markings to Show Changes Made**".

The application is considered to be in condition for allowance. The Examiner is respectfully requested to take such action. If the Examiner has any questions, he is invited to contact the undersigned at the below-listed telephone number. HOWEVER, ALL WRITTEN COMMUNICATIONS SHOULD CONTINUE TO BE DIRECTED TO: IP ADMINISTRATION, LEGAL DEPARTMENT, M/S DL429, AGILENT TECHNOLOGIES, INC., P.O. BOX 7599, LOVELAND, CO 80537-0599.

Respectfully submitted,

October 30, 2001

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(520) 399-3203

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Paragraph **[0069]** beginning at line 8 of page 12 has been amended as follows:

[0069] One method of actuation which imposes a tilt is given, for example, in U.S. Patent 5,954,079, "Asymmetrical Thermal Actuation in a Microactuator", and it is shown in that patent that tilting actuation offers improved control in the presence of physical phenomena which could lead to snap-off and snap-in. In that patent the physical phenomenon leading to snapping actuation was a thermal phenomenon. In the present invention, surface attraction and stiction due to Van der Waals forces and other forces can be expected to lead to snapping phenomena similar to those noted in, e.g., J.N. Israelachvili, Intermolecular and Surface Forces, Academic Press, New York, pp. 14-15 (1995), and section 10.7, and tilting actuation used to separate surfaces 130 and 136 is expected to reduce or eliminate such snapping phenomena. Various means of tilting actuation will occur to those skilled in the art and may be employed without departing from the scope and spirit of the present invention.

Paragraph **[0094]** beginning at line 23 of page 19 has been amended as follows:

[0094] Following assembly, the device 100 is then immersed in a desired liquid ionic conductor 170 as shown in [Figs] FIGS. 3a, 3b, and 3c, and an ionic current is established through the aperture 102 by applying a voltage to electrodes 176 and 178 on opposite sides of the aperture. [Tubing] Walls 174 and 172 comprising, for example, a glass or a polymer may be attached to one or more of lower and upper surfaces 132 and 134 by means including, but not limited to, adhesives, clamps and gaskets, and anodic bonding in order to isolate solution 170 from the surroundings.

Paragraph **[0114]** beginning at line 19 of page 25 has been amended as follows:

[0114] Another alternative embodiment 700 of the invention is illustrated in FIGS. 7a-7b. Hole 702 in membrane 704 is formed by means similar to those used to form hole 602. Edge 706 of body 708 is part of edge 710 which bounds a planar surface of body 708. Edge 706 intersects hole 702 to form an arched opening 712 through which a sphere 714 of di-

ameter 716 may pass. The crown of the arch is point 718, the springer points of the arch are points 720 and 722, and the base of the arch is formed by edge 706. Body 708 is formed by means of, for example, chemical vapor deposition, photolithography, and etching on a surface of substrate 724 which is later etched to form cantilever 726. Cantilever 726 may contain sensing means (not shown), such as piezoresistive sensors to monitor the contact force between membrane 704 and body 708. Such sensing means are well known to those skilled in the art of atomic force microscopy. Cantilever 726 may contain actuation means (not shown), such as piezoelectric actuators to move body 708 in three directional axes and a rotational axis with respect to membrane 704. Such actuators have previously been used in cantilevers for scanning tunneling microscopy, for example, T.R. Albrecht et al, "Microfabrication of integrated scanning tunneling microscope", Journal of Vacuum Science and Technology, Vol. A8(1), pp. 317-318 (Jan/Feb 1990).